UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/435,748 | 11/08/1999 | JAMES P. BUCKLEY | N19.12-0028 | 5623 |

24113 7590 10/23/2003

PATTERSON, THUENTE, SKAAR & CHRISTENSEN, P.A.
4800 IDS CENTER
80 SOUTH 8TH STREET
MINNEAPOLIS, MN 55402-2100

| EXAMINER | |
|---|---|
| RUTHKOSKY, MARK | |
| **ART UNIT** | **PAPER NUMBER** |
| 1745 | 25 |

DATE MAILED: 10/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/435,748 | BUCKLEY ET AL. | |
| | Examiner | Art Unit | |
| | Mark Ruthkosky | 1745 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☐ Claim(s) *29-44,52-54 and 58-89* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *29-44,52-54 and 58-89* is/are rejected.

7)☐ Claim(s) *29-44,52-54 and 58-89* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

## DETAILED ACTION

### *Status of Claims*

Claims 29-44, 52-54 and 58-77 are active in the application. New claims 78-89 have been added.

### *Claim Rejections - 35 U.S.C. § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 29-44, 52-54 and claims 58-77 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The instant claims use the phrase "less than about." This phrase is indefinite as "less than" defines a lower limit, while the term "about" contradicts the value of the lower limit. As shown in the MPEP, section 2173.05(b), the phrase "at least about" is held as indefinite.

Regarding claims 36, 38, 66 and 68, the word "derivative" renders the claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by "derivatives"), thereby rendering the scope of the claim(s) unascertainable. The identity of the derivations of the electrode material is unclear and includes elements not actually disclosed. Thus, the scope of the claim(s) is unascertainable. As an example, lithium cobalt oxide is a claimed formula, however, lithium cobalt manganese oxide, which may be considered a derivative, is not disclosed. The word derivative renders the claim indefinite. The same reasoning rejects new claims 78-89.

### *Specification*

The amendment filed 4/21/2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: In claims 29-44, 52-54, 58-83 and 85, the average thickness of an electrode has been amended to be less than about 9.5 microns. There is no support in the specification for this specific point. The applicant has provided pages 50-51 as support for the change in the amendment; however, no support is found for less than about 9.5 microns. In claims 84-89, there is no support for a current collector average thickness of less than about 4.5 microns. There is no support in the specification for this specific point. The applicant has provided pages 50-51 as support for the change in the amendment; however, no support is found for less than about 4.5 microns. Applicant is required to cancel the new matter in the reply to this Office Action.

### *Claim Rejections - 35 U.S.C. § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 29-33, 39, 53, 58-63, 69 and 76 stand rejected under 35 U.S.C. 102(e) as being anticipated by Dansui et al. (US 6,033,805.)

The instant claims are to a battery comprising a positive electrode, a negative electrode and a separator between the positive and negative electrodes wherein at least one of the electrodes has an average thickness of less than 9.5 microns and comprises a powder comprising electroactive particles having an average diameter of less than about 500 nm.

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. An electrode has an average thickness of less than about 10 microns. For example, column 3, lines 5-10 shows an electrode layer of 10-60 microns on a collector foil and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm is interpreted to be "less than about" 9.5 μm. The electrode active material comprises a powder of cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 10 microns (see example 1.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles and is attached to a current collector (see the examples.) Thus, the claims are anticipated.

***Claim Rejections - 35 U.S.C. § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 34, 35, 37, 38, 41, 42, 43, 44, 52, 54, 64, 65, 67, 68, 71, 72, 73, 74, 75, and 77 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Satoh et al. (US 5,571,638.)

Dansui et al. (US 6,033,805) teaches battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The electrode has an average thickness of less than about 10 microns. For example, column 3, lines 5-10 shows an electrode layer of 10-60 microns on a collector foil, and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm on one or both sides of the foil (~20μm) is interpreted to be less than about 9.5 μm. The active material comprises a powder comprises cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 10 microns (see example 1.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles, and is attached to a current collector (see the examples.) Dansui et al. (US 6,033,805) does not teach the specific electrode materials and current collectors described in the dependent claims of this rejection.

Satoh et al. (US 5,571,638), however, teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The active material comprises a powder comprises lithium transition metal oxide electroactive particles having an average diameter of less than about 500 nm (see example 2 and claim 15), a conductive powder and binder (see claims 1-10.) The anode material is a carbon powder with a size ranging from 10 nm to 50 micron (see the paragraph bridging cols. 3-4.) Current collectors of stainless steel, copper and aluminum are noted in col. 7, lines 55+. Polymer separators having a thickness of about 10 microns are noted (see example 8 and col. 8, lines 1-45.) The active material may be the positive or negative electrode depending on the state of charge of the

battery. The active material is mixed with a binder and conductive particles, and is attached to a current collector (see the examples.)

It would be obvious to one skilled in the art at the time the invention was made to prepare materials with nanometer sized particles as these methods are taught in the art as described. Further, it would be obvious to prepare electrodes with various thicknesses as the small particle sizes will allow for electrodes with an average thickness of less than about 10 microns, as taught in Dansui et al. (US 6,033,805.) One of ordinary skill in the art would have the knowledge to use the electrode materials of Satoh et al. (US 5,571,638) in a thin electrode battery as taught Dansui et al. (US 6,033,805) as it is clear that electrodes can be prepared with an average thickness of less than about 10 microns. In addition, one of ordinary skill in the art would have the knowledge to incorporate the thickness of the electrodes of Dansui et al. (US 6,033,805) into the thin battery of Satoh et al. (US 5,571,638) as the small particles will allow for the production of a thin electrode with binders and conductive particles. The use of various current collectors would be obvious as each are well known in the art to conduct current from an electrode material.

Dansui et al. (US 6,033,805) and Satoh et al. (US 5,571,638) are silent to the surface roughness of the separator, however, Satoh et al. (US 5,571,638) teaches the surface roughness of the current collectors to be 0.1-10 microns to increase bonding. It would be obvious to one skilled in the art at the time the invention was made to have materials in the electrode assembly with a surface roughness of 0.1-10 microns to increase the bonding of the materials. The current collector is bound to the active material in the same manner the separator is bound to the active material on the opposite side of active material. One of ordinary skill in the art would recognize that a surface roughness of 0.1-10 microns would increase the bonding and adherence of the materials in the electrode assembly.

With regard to claims 44 and 74, Dansui et al. (US 6,033,805) and Satoh et al. (US 5,571,638) do not teach the electrode current collector to be made of graphite paper, however, it

would be obvious to one of ordinary skill in the art at the time the invention was made to use graphite paper as a current collector in the batteries of Dansui et al. (US 6,033,805) and Satoh et al. (US 5,571,638.) Graphite is a well-described electron conductor as shown in both references. The electrode current collectors taught in the references are used to transfer electrons to and from the electrodes. One of ordinary skill would recognize that a graphite sheet or paper will provide the same means for transferring electrons to and from the electrodes as the metal sheets described in the references.

Claims 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 53, 64, 65, 66, 67, 68, 70, 71-73, 76, 77 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Kawakami et al. (US 6,165,642.)

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes as previously described. Dansui et al. (US 6,033,805) does not teach the specific electrode materials and current collectors described in the dependent claims of this rejection.

Kawakami et al. (US 6,165,642) teaches a rechargeable lithium battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The electrode includes an active material comprising a powder of lithium transition metal oxide electroactive particles having an average diameter of less than about 500 nm (see examples 2-4 and claim 1), a conductive powder and binder (see claims 1-18 and examples 1-4.) The size distribution of the active material is between 0.5 to 50 nm in examples 2-4. The anode material may be a transition metal oxide, lithium material or a carbon powder (see col. 9.) Solid and gel electrolytes may be used in the cell (see col. 10.) Current collectors of stainless steel, copper and aluminum are noted in col. 9 and the examples. Polymer separators are noted in the examples. The active material may be the positive or negative electrode depending

on the state of charge of the battery. The active material is mixed with conductive particles and attached to a current collector (see the examples.)

It would be obvious to one skilled in the art at the time the invention was made to prepare materials with nanometer sized particles as these methods are taught in the art as described. Further, it would be obvious to prepare electrodes with various thicknesses as the small particle sizes will allow for electrodes with an average thickness of less than about 10 microns, as taught in Dansui et al. (US 6,033,805.) One of ordinary skill in the art would have the knowledge to use the electrode materials of Kawakami et al. (US 6,165,642) in a thin electrode battery as taught by Dansui et al. (US 6,033,805) as it is clear that electrodes can be prepared with an average thickness of less than about 10 microns. In addition, one of ordinary skill in the art would have the knowledge to incorporate the thickness of the electrodes of Dansui et al. (US 6,033,805) into the thin battery of Kawakami et al. (US 6,165,642) as the small particles will allow for the production of a thin electrode with binders and conductive particles. The use of various current collectors would be obvious as each are well known in the art to conduct current from an electrode material.

Claims 36 and 66 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805) in view of Kawakami et al. (US 6,165,642) as applied above, and further in view of Miyasaka et al. (US 6,037,095.)

With regard to claims 36 and 66, Kawakami et al. (US 6,165,642) teaches the anode material may be a transition metal oxide, lithium material or a carbon powder. Kawakami et al. (US 6,165,642) does not specifically teach tin oxide as an anode material, however one of ordinary skill in the art would recognize that tin oxide is a well known transition metal oxide used as an anode in lithium secondary cells. For example, Miyasaka et al. (US 6,037,095) teaches a lithium ion secondary battery with a tin oxide anode or negative electrode (see claim 2.) It would be obvious to one skilled in the art at the time the invention was made to use tin

oxide as the transition metal oxide anode material of Kawakami et al. (US 6,165,642) as tin oxide will allow for the equivalent transfer of ions in the battery as the transition metal oxides of Kawakami.

***New Rejections***

Claims 84, 85, and 88 are rejected under 35 U.S.C. 102(e) as being anticipated by Dansui et al. (US 6,033,805.)

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. An electrode has an average thickness about 10 microns. For example, column 3, lines 5-10 shows an electrode layer of 10-60 microns on a collector foil and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm is interpreted to be "less than about" 9.5 μm due to the limitation about. The electrode active material comprises a powder of cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 5-20 microns (see col. 3, lines 1-10 and 10 μm in example 1.) A value of 5 microns is considered to be "less than about" 4.5 microns due to the limitation "about." The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles and is attached to a current collector (see the examples.) Thus, the claims are anticipated.

Claims 78-83, and 86-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dansui et al. (US 6,033,805.)

Dansui et al. (US 6,033,805) teaches a battery comprising a positive electrode, a negative electrode and a polymer separator between the positive and negative electrodes. The electrode has an average thickness of less than about 10 microns. For example, column 3, lines 5-10

shows an electrode layer of 10-60 microns on a collector foil, and claim 16 shows a layer of 10-60 microns on each side of the foil. Using the lower limit, 10 μm on one or both sides of the foil (~20μm) is interpreted to be "less than about" 9.5 μm. The active material comprises a powder comprises cobalt hydroxide electroactive particles having an average diameter of less than about 200 nm (see example 2 and claim 15.) The current collectors and separators have a thickness of about 10 microns (see example 1.) The active material may be the positive or negative electrode depending on the state of charge of the battery. The active material is mixed with a binder and conductive particles, and is attached to a current collector (see the examples.) Dansui et al. (US 6,033,805) does not teach the electrode to have an average thickness of less than about 5 microns, from 250 nm to 2.5 microns or from 300 nm to about 1 micron. It would be obvious to one of ordinary skill in the art at the time the invention was made to alter the thickness of the electrode as one of ordinary skill in the art would understand that adding more or less active material to an electrode will increase/decrease the capacity of the battery. One of ordinary skill in the art would alter the amount and therefore the size of the electrode in order to achieve a desired capacity for a battery.

Further, the Dansui et al. (US 6,033,805) reference does not teach current collectors to have an average thickness of less than about 2.5 microns, or from 0.25 to about 1 micron. It would be obvious to one of ordinary skill in the art at the time the invention was made to alter the thickness of the electrode current collector as one of ordinary skill in the art would understand the relationship between the size of the current collector and the conduction of the electrons through the current collector to and from the electrode. One of ordinary skill would understand that decreasing the size of the current collector would allow for the inclusion of more

active material in a battery electrode and therefore a higher capacity. Further, one of ordinary skill in the art would recognize that electronic conduction through the current collector would require access to the collector in order from the active material in order to conduct electrons to and from the electrode. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

***Response to Arguments***

Applicant's arguments filed 10/15/2001 have been fully considered, but are no persuasive.

The applicant argues that the rejections under 35 U.S.C. 112 are improper. The examiner disagrees. The applicant is arguing that the claim language "less than about 9.5 μm" should only be held indefinite in circumstances where close prior art is provided, citing Amgen Inc. vs. Chugi Pharmaceutical Co. Ltd. As the difference of the electrode thickness in the claim as compared to the art is 0.5 μm, the art is considered close prior art and the rejection is deemed proper. Further, it is not clear as to what is the limiting range of the claim. If about 9.5 μm is 20 μm, then less than about 9.5 may be about 19.8 μm. Of course, this number contradicts the "less than 9.5 μm" section of the limitation. As this limitation in the claim is not definite or clear, the rejection is proper.

With regard to the use of the word derivative in the claim, it is not clear what is considered a limitation of the claim with regard to the word "derivative." The applicant cites Exxon Research and Engineering Co. as law stating that if one skilled in the art would understand the bounds of the claim when read in light of the specification, then the claim is

definite. With regard to tin oxide noted in claim 36, the specification offers no guidance as to derivatives that may be considered within the bounds of the claim. With regard to the list of metal oxides noted in claim 36, the specification offers no guidance as to derivatives that may be considered within the bounds of the claim. Is it a combination of materials or any material, which includes one element of the list? Further, it is not clear as to what are the limiting elements of the claim. The applicant cites the genus term halogen as an example that need not include all species listed to understand the scope of the claim. In comparison with the word "derivative," the terms halogen and alkanes have a well-defined meaning with regard to chemical materials and the term "halogen substituted alkanes" is understood as halogens and alkanes have specific identities. The scope of "derivatives" of a list of nine generic materials, mixtures and composites thereof is not supported by the specification such that one skilled in the art would understand the bounds of the claim. The specification offers no guidance as to derivatives that may be considered within or beyond the bounds of the claim.

With regard to the applicant's arguments to the rejections under 35 U.S.C. 102 and 103, stating that the applicant's amendment to a thickness of 9.5 μm overcomes the art, the examiner disagrees. The applicant's claims state less than about 9.5 μm. The examiner is interpreting the claims to include 10 μm as less than about 9.5 μm due to the word "about" in the claim and therefore, the claim is anticipated. As all of the arguments are based on this assertion, the interpretation of the claims is applied to all of the arguments.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Examiner Correspondence***

Any inquiry regarding this communication or a previous communication should be directed to Examiner Mark Ruthkosky, whose telephone number is (703) 305-0587 or his supervisor, Patrick Ryan, whose phone number is (703) 308-2383. Please note that Examiner Ruthkosky and SPE Ryan out of the office each Friday of bi-week period. The PTO official fax number is 703-872-9306.

Mark Ruthkosky
Patent Examiner
Art Unit 1745

10/16/03